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Forest Research Notes

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EFFECT OF DIELDRIN IN THE GLUE LINE OF OAK PLYWOOD PANELS IN PREVENTING *LYCTUS* BEETLE DAMAGE

For many years the lumber industry has been seeking improved methods of preventing decay and insect damage to lumber and other wood products. One relatively new approach to this problem is the addition of toxic chemicals in plywood glues to prevent infestations or restrict feeding injury by wood-boring insects. Wood products treated in this manner have been marketed in some countries, and studies have shown that the toxic additives are effective in preventing certain types of insect damage.[1]

At present, similarly treated plywood is not available in the United States. However, test samples have been prepared by manufacturers interested in a damage-free product. In 1958, special oak plywood panels were made for testing the effectiveness of various concentrations of dieldrin[2] in several types of glue for preventing infestations by a powder post beetle. This note summarizes the initial results with this experimental product.

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[1]Tamblyn, N. and Gordon, A. Control of borer attack in plywood by use of preservative in the glue. CSIRO Forest Prod. News Let. 180: 1-2. 1950.

[2]Mention of commercial products is not to be construed as endorsement of them by the Forest Service or U. S. Department of Agriculture.

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Test Materials

Plywood.--The test samples were red oak plywood (3/16 inch-3 ply) panels, 6 inches square, with dieldrin combined in four adhesive mixes. Dieldrin concentrations were based on percent of weight of glue solids and varied from 0.1 to 0.5 percent. The panels were coded as follows:

Adhesive mix	Code No.	Dieldrin Content--Percent Actual A	B	C	D
Cold Press Casein	K 8881	0.0	0.1	0.25	0.5
Cold Press Urea	K 8882	.0	.1	.25	.5
Hot Press Urea	K 8883	.0	.1	.25	.5
Hot Press Phenol	K 8884	.0	.1	.25	.5

Each test replicate included the 16 possible combinations of glue-dieldrin mixtures. Fresh-cut pieces of oak limbwood of the type used to breed *Lyctus* were added to each replicate as controls to help evaluate the test method and the suitability of the plywood as food for the beetles.

Insects.--Adults of the southern lyctus beetle, *Lyctus planicollis* Lec., were the test insects, and only those beetles which had emerged within a 24-hour period from infested wood in culture cans were used as test specimens.

Procedure

Each 6-inch plywood panel was quartered into 3-inch squares, and two of these were designated as samples for each panel. The exposed toxic glue line was sealed with paraffin. Test containers were glass lantern chimneys with cheesecloth covers. Thirty *Lyctus* adults were placed in each container with two plywood sections.

Five replicates were exposed to attack in November and December 1958 and maintained at room temperature (72° - 75°F.) and low humidity. Two more replicates were started in March 1959 in a temperature-humidity controlled room at 80°F. and approximately 40-percent humidity. These latter conditions are very favorable for powder post beetle development. In the first lot when no evidence of *Lyctus* feeding was detected in 5 months (where the humidity possibly was too low for normal development), the test samples of these five replicates were transferred to the controlled room in May and reinfested with fresh beetles.

At the conclusion of the test in December 1959, each plywood section was examined microscopically and partially dissected whenever suitable oviposition sites for the beetle were evident. Where larval frass or an opening to the sur-

Table 1.--Summary of data on plywood sections attacked by beetle larvae

Dieldrin concentration	Test units	Infested	Potential damaging insects[1]	
Percent	Number	Percent	Number	Percent
0.0	10	41.7	135	81.8
.1	10	41.7	23	13.9
.25	3	12.5	6	3.7
.50	1	4.1	1	.6

[1]These are insects removed by dissection of the plywood.

face was detected, the galleries were exposed to measure the length and depth of penetration by the larvae. On the oak limbwood controls, only adult emergence holes were counted, indicating the successful completion of a generation.

Results

There was no obvious damage to any of the plywood sections. However, microscopic examination revealed that eggs were deposited and hatched on 21 percent of the test panels. Table 1 summarizes the data on the infested plywood sections.

All the *Lyctus* beetle larvae recovered in dissection were dead, and feeding had been restricted to 2/16 to 3/16 of an inch laterally and about 1/32 of an inch in depth. No direct tunneling to the toxic glue line was apparent, although there is the possibility that toxic chemical penetration from the glue could have influenced survival. Since feeding patterns did not vary between toxic and nontoxic test samples, it was concluded that the larvae survived for only a brief period and that a deficiency of necessary nutrients was the primary control factor. Other recent studies have shown that the nutritional requirements of *Lyctus* are quite exacting, with high starch content a critical component of the larval diet. Apparently the plywood used in this test was largely heartwood and low-starch sapwood which is unsuitable for normal development and survival.

In contrast, nearly all the 1 x 3-inch cylindrical sections of oak limbwood were moderately to heavily infested. Larvae were still actively feeding when the test was terminated. Five sets of these controls completely disintegrated

in 4 to 5 months from heavier attack, and in all cases, an accurate count of the numbers of emerging adults was impossible.

In summary, no significant effect was shown by different concentrations of dieldrin in the glue line of the test plywood sections. The type of glue apparently did not affect the results. Because starch content is a critical factor, it is suggested that further testing of this potentially valuable method of preventing *Lyctus* beetle damage to oak plywood be done using woods with high-starch content. Or, so long as low-starch content material is used, the plywood is relatively safe from attack.

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